

**RESPONSE AND REQUEST FOR RECONSIDERATION**

**Support.**

The amendments have the effect of requiring component (c) to be present and to be a boric acid, boron trioxide, or certain short chain boron esters. Support is found in paragraph 0033 and in original language that indicates that either (c) or (d) or both are present. Applicants have elected to select the options that (c) is present or alternatively both (c) and (d) are present.

The amendments also specify that the dispersant is a succinimide dispersant, as set forth in original claim 2. The amendments also specify that the inorganic phosphorus compound is an inorganic phosphorus acid or anhydride, as disclosed in paragraph 0034. It is noted that both oxygen- and sulfur-containing acids and anhydrides are both encompassed by the present language.

In claims 17 and 18, a non-zero lower limit for the relative amount of component (c) is introduced, consistent with the fact that (c) is now a required component. Support is found in the claim as originally written, which specifies in each case a total minimum amount of (c) plus (d). If (d) is elected to be zero, then the amount of (c) will inherently be at least the minimum value cited.

In claim 27, language is added to indicate that a mixture of the indicated components is heated together. Support is found in paragraph 0032. Heating together a mixture of the components is to be distinguished from adding and reacting each of the components sequentially.

Original claim 9 has been rewritten as new independent claim 28. New claim 29 further indicates that a mixture of the components of claim 28 has been heated together.  
**Response.**

The present amendments are a re-presentation of the amendments proposed in the after-final response of March 8, 2007, along with some additional amendments to more specifically define the invention. These are submitted in response to the Examiner's remarks in the Advisory Action of March 14, 2007, stating that, had the prior amendment been entered, the inventive and comparative data earlier presented would still not have been commensurate in scope with the claimed invention, since the claims were, at that time, open to any boron or phosphorus compound and to any dispersant.

The claims now specify that the dispersant is a succinimide dispersant. The comparative data presented in the Declaration of October, 2006 provided data based on a succinimide dispersant.

The claims now also specify that the borating agent is boric acid, boron trioxide or certain short-chain and alkyl borates. The data in the Declaration compared the reaction with boric acid against the reaction with a longer chain (tri-C<sub>8</sub>) alkyl borate. It

is noted that boric acid, boron trioxide, and short chain ( $C_6$  or less) alkyl borates share the common property of being substantially insoluble in oils of lubricating viscosity, in contrast to longer chain alkyl borates. This is analogous to the situation with regard to solubility of DMTD compounds as discussed in paragraph 0030. The Examiner's attention is also directed to claim 28, which specifies that the borating agent is boric acid, which is exactly the material that was used in the Declaration.

The claims also specify that the inorganic phosphorus compound is an acid or anhydride. The data in the Declaration employed phosphorous acid.

It is submitted that the claims, as amended, are commensurate in scope with the improvement demonstrated by the Declaration, and thus are now allowable.

For completeness, the essence of the response submitted on March 7, 2007, is now resubmitted, with some modifications to reflect the additional amendments submitted herewith.

With regard to claim 27, it is submitted that the present amendments, specifying that a mixture of the indicated components is heated together, will answer the Examiner's objection with regard to the Davis reference, '043. The Examiner had objected that the initially proposed language, reciting a step of "heating together," would not exclude heating together of a preformed dispersant containing boron or phosphorus, with DMTD. However, now that a mixture of these components is specified, it is believed that it is plain that the reaction mixture will contain all the required component, in contrast to what is alleged to have been taught by Davis. Davis discloses merely the heating of a mixture of DMTD with a dispersant (col. 9 line 19), wherein the dispersant might have been (previously, separately) post-treated with boron compounds or phosphorus compounds (col. 3 lines 36-41).

The Examiner had objected to Applicants' argument that there is no motivation in Davis to choose a dispersant treated with boron or phosphorus over other disclosed dispersants. In fact, however, in order to arrive at the composition of the present invention starting from Davis would require a selection, from among the scores if not hundreds of types of dispersants available, one of the dispersants which is not from Davis's "preferred" group. Moreover, any *prima facie* case of obviousness is overcome by the evidence presented in the Declaration from Dr. Tipton, when considered in light of the discussions herein.

The Examiner had also objected to Applicants' statement that boric acid is only slightly soluble in oil and would not normally be used as such in a lubricant formulation. In this regard, the Examiner cited the apparent use of boric acid in the formulation of Le Suer, 3,087,936. A careful reading of Le Suer, however, will reveal that boric

acid is not used, *as such*, in a lubricant formulation. Le Suer prepares oil-soluble nitrogen- and boron-containing compositions. It is those compositions that are used in lubricant formulations, and those compositions are themselves prepared, in turn, by reaction of boric acid with an acylated nitrogen compound (see col. 17 lines 16 – 20). Boric acid itself is not used directly in a lubricant formulation of Le Suer.

If boron is to be usefully imparted to a lubricating composition, it must be provided in some soluble form. It may, indeed, be solubilized by reaction with a nitrogen-containing dispersant. Or, as is frequently done, it may be provided as a soluble borate ester such as, for example, a tri-C<sub>8</sub> alkyl borate, a relatively long carbon chain ester. This solubility requirement is, in particular, why Dr. Tipton, in his Declaration, compared a formulation containing a mixture of DMTD-treated dispersant plus tri-C<sub>8</sub> alkyl borate, against the DMTD-treated dispersant which had also been borated. Both of these formulations could properly be used as lubricant formulations, but a formulation which merely contained unreacted boric acid, as such, would be unsuitable as a lubricant formulation, at least for any reasonable applications such as engine or transmission lubrication.

It is when this proper comparison is made that one of the advantages of the present invention becomes apparent. That is, the total amount of additive can be significantly reduced when both the boron component and the DMTD component are combined onto the dispersant moiety. This comparison is properly made against a reasonable and feasible lubricant formulation, not a hypothetical and non-functional formulation containing insoluble, unreacted boric acid.

As to the breadth of the present claims, it is submitted that it is now commensurate with the data that has been presented. In particular, the claims now require that the boron component is, in effect, an insoluble material (boric acid, trioxide, or a short chain ester) and such a material is reacted with the dispersant. It is for such an embodiment that a significant advantage was shown, in terms of weight of additives. The corresponding advantage in the case where only the phosphorus component was reacted (no longer a part of the present claims) was less pronounced, although in both cases the advantage of a simplified additive package pertains.

The Examiner's attention is again directed to new claim 28, which represents the subject matter of original claim 9 rewritten in independent form. The reaction product of a succinimide dispersant with DMTD and, specifically, boric acid, even more specifically corresponds in scope with the experimental evidence presented.

Conclusion.

For the foregoing reasons it is submitted that the present claims are in condition for allowance. The foregoing remarks are believed to be a full and complete response to the outstanding office action. Therefore an early and favorable reconsideration is respectfully requested. If the Examiner believes that only minor issues remain to be resolved, a telephone call to the Undersigned is suggested.

Any required fees or any deficiency or overpayment in fees should be charged or credited to deposit account 12-2275 (The Lubrizol Corporation).

Respectfully submitted,

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